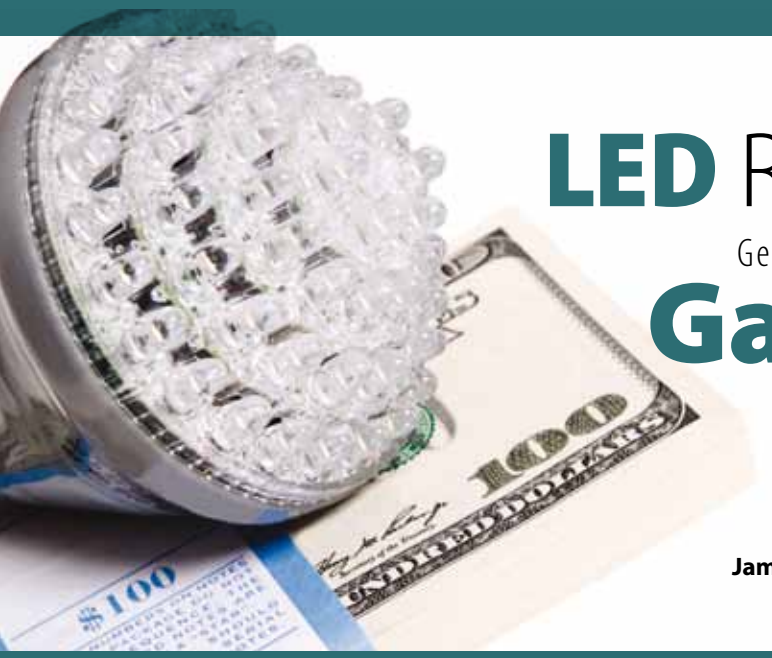


LED Replacement Lamps: Getting Ready for a Game-Changing Decade

James Brodrick, Lighting Program Manager , U.S. Department of Energy

Big changes are in store for the replacement lamp market, thanks to the *Energy Independence and Security Act of 2007* (EISA), which calls for the phase-out of low-efficiency lamps.

The first phase, which will be rolled out between 2012 and 2014, will effectively put an end to the Incandescent Age by pointing consumers toward alternatives that are more energy efficient, like compact fluorescent lights (CFL), light emitting diode (LED), and next-generation halogen products.

But that's just the beginning. In 2020, those standards will be superseded by an even more stringent set that calls for a minimum efficacy of 45 lm/W (lumens per watt), spurring the entire industry to come out with products that are increasingly more efficient.

This will certainly boost the market for LED lighting products, given their tremendous energy-saving potential. But it's important to keep in mind that because of the newness of the technology, potential has not yet been achieved, despite the rapid pace of development. It's true that LED lighting products can save energy and provide high-quality lighting in a growing number of applications, but while some of those products meet manufacturer claims and equal or even exceed their traditional counterparts in performance, many do not.

On top of that, LED technology and controls are fundamentally different from those of conventional lighting, which means there's a significant learning curve for both manufacturers and buyers. And, as with any new technology, there's a lack of field data. Coupled with a general unfamiliarity with LED products, this add to a profusion of hype and misinformation.

ARE LED REPLACEMENT LAMPS READY?

So the big question is, are LED replacement lamps ready to fill in the gap that will be left when incandescent products are phased out?

We can get a good idea of what the answer is by looking at data from the U.S. Department of Energy's (DOE) Lighting Facts® program (*www.lightingfacts.com*). It is a voluntary program based on the Lighting Facts label, which presents LM-79-verified performance data on LED lighting products in a standardized, easy-to-read way. (LM-79 refers to LM-79 *Electrical and Photometric Measurements of Solid-State Lighting Products*, which is published by the Illuminating Engineering Society of North America.)

Manufacturers pledge to use the Lighting Facts label on their products, while retailers, distributors, lighting professionals, utilities, and energy-efficiency organizations pledge to look for and use products that bear it. To date, more than 1,000 products are registered with Lighting Facts, which makes it the largest database of its kind.

What that database shows us is that while current LED omnidirectional replacement lamps meet 2012–2014 efficacy levels required by EISA, most can only match the light output of 40W incandescent lamps. Although LED products that can meet the light output of 60W incandescent lamps are starting to appear, there are still products out there that can't even meet 40W equivalency.

It's also important to note that for any LED lighting product, light output and efficacy aren't enough. You still need to consider such factors as color quality, light distribution, and lifetime to ensure that product performance is acceptable to consumers. And right now, the data show that many LED replacement lamps do not meet these other product performance metrics.

Despite the fact that LED replacement lamps may not currently be ready to fill all of the gaps left by incandescent lamps, there is still more than a year before the first phase of EISA takes effect, and LED performance continues to rapidly improve, with no sign of slowing down.

LED replacement lamps that meet 60W incandescent light levels just showed up on the market in 2010, for example. DOE's projections indicate that the light output of white LED packages continues to increase—literally at an exponential rate.

The market is by no means static, and to keep up with rapid changes, DOE Lighting Facts has just released the first version of what will become a biannual "snapshot" of the LED replacement lamp market, as the effective dates of EISA draw closer. Stay tuned for updates.

LESSONS LEARNED FROM OVERSEAS

The U.S. won't be the first country to phase out inefficient light bulbs. Europe and Australia, for example, started the process last year, with standards of their own that are similar to those mandated by EISA. What were the lessons learned there? Let's start with Australia. Its minimum-efficiency standards went into effect in November of last year, and all wattages were affected.

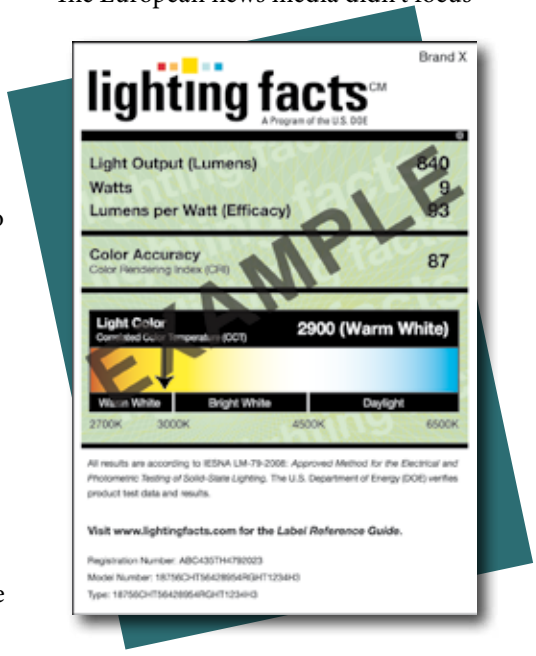
The Australian government was minimally involved in preparing the public, and the reaction from the Australian news media was largely positive when the upcoming change was first announced in February 2007. But then things quieted down until several months before the new standards took effect. Then there was a flurry of negative media coverage, which mainly focused on CFLs and centered on their mercury content and quality concerns such as color inconsistency, flicker, and dimming issues. There was some stockpiling of "banned" bulbs in Australia, but no substantial consumer backlash after the new standards went into effect. Energy-efficient halogen bulbs were widely available and were readily accepted by Australian consumers, whereas CFLs had a smaller overall impact.

Europe took a phased approach to its new standards, similar to the approach that will be used here in the U.S. The first phase took effect in September of last year and affected 100W bulbs, with other wattages to follow in yearly increments.

There was no coordinated educational effort from the European Commission, so every European country was on its own, and implementation methods and results varied from country to country.

One trend that emerged was that when new standards were preceded by a government announcement, the public reaction was much more positive than when there was no such announcement. And in those countries where the new standards were announced a full year in advance, there was considerably more stockpiling of the "old" bulbs.

The European news media didn't focus



on any alternatives other than CFLs, with negative coverage about color, flicker, and dimming as well as possible health problems and mercury content. In some of the countries, news stories also brought up issues of government control and citizens' rights. But in several countries, media coverage was either neutral or positive and stressed the new standards' environmental benefits.

EDUCATION IS KEY

A major lesson from Australia and Europe is that consumer education is key to a good transition to new standards for increased replacement bulb efficiency. One aspect of this education involves teaching consumers how to distinguish between the different energy-efficient products that are entering the marketplace.

The U.S. Federal Trade Commission's new consumer labeling requirements for lamps, which go into effect next year, will help in that regard. Based on a multi-format label patterned on the Lighting Facts label, they require lumens and energy cost to be put on the front of the packaging, with Lighting Facts on the back. This will help consumers focus on lumens rather than watts as an indication of brightness, so that they'll be better able to evaluate just how efficient and effective a replacement lamp is.

But product labeling isn't enough. DOE recently announced an effort to address the need for consumer education in response to requests from its Lighting Facts partners, primarily retailers. DOE will support efforts to educate consumers about lighting changes by providing them with a communication platform they can use to familiarize consumers with lighting options and applications. This will prepare them for EISA's impact, avoid negative perception of the new lighting requirements, and minimize stockpiling of phased-out bulbs. This initiative is still in the planning stage, with a number of partners—including The Home Depot, Costco Wholesale, Grainger, and Lowe's, along with their manufacturer suppliers (GE, Philips, Cree, and Osram Sylvania) already on board to work with DOE in this effort.

The transition to more efficient lighting won't be smooth unless all parties, beginning with the retailers and their suppliers as well as utilities and energy-efficiency programs, work together. If that happens, the result will be significant energy savings and a smaller carbon footprint—something that ultimately works to the advantage of everyone.

James Brodrick manages the U.S. Department of Energy's Solid-State Lighting Program.